

Hemlock Bridge  
Warner Drive over Black River  
Warner Township  
Clark County  
Wisconsin

HAER No. WI-5

HAER  
WIS  
10-WARNT,  
1-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD  
NATIONAL PARK SERVICE  
ROCKY MOUNTAIN REGIONAL OFFICE  
DEPARTMENT OF THE INTERIOR  
P.O. BOX 25287  
DENVER, COLORADO 80225

HAER  
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1-

HISTORIC AMERICAN ENGINEERING RECORD

Hemlock Bridge

HAER No. WI-5

Location: Spanning the Black River at Warner Drive. On the western half of the north-south 1/4-line of section 15, Warner Township (T27NR2W)  
UTM: 15688760.4965630  
Quad: Greenwood, Wisconsin 7.5' Quad.

Date of Construction: 1914

Present Owner: Warner Township, Wisconsin

Present Use: Vehicular and pedestrian bridge. The nearest alternative crossings are eight miles to the north and three miles to the south.

Significance: The Hemlock Bridge is one of six Pennsylvania truss bridges in Wisconsin. It is an example of the early design and practice of the Wisconsin State Highway Commission and of the construction work of Wausau Iron Works.

Historian: Robert S. Newbery, Wisconsin Department of Transportation, March 1983.

Historical Report  
Hemlock Bridge  
Clark County  
Wisconsin

Significance

The Hemlock Bridge on Warner Drive over the Black River is a three span structure with a total length of 248 feet. Its main span is a 200 foot Pennsylvania truss. The bridge is significant for several reasons: it is one of six Pennsylvania truss bridges remaining in Wisconsin; it is an example of the early design and practice of the Wisconsin State Highway Commission; and it is an example of the work of Wausau Iron Works, an important bridge construction firm in Wisconsin. Both the crossing and the adjacent village of Hemlock, however, had played out their minor historical roles before the Hemlock Bridge was built.

The Crossing

In the 1880's the road here may have crossed the Black River on a logging dam.<sup>1</sup> In 1894, Warner Township sought and received the approval of the county board for a bridge to be built some 600 feet downstream from the dam. Wisconsin Bridge & Iron Company was awarded the contract for \$5,400 to build a 200 foot truss bridge on steel caissons. This bridge was raised four feet and provided with approach spans in 1908, but despite the increased clearance it was washed out in the flood of June 1914, and the town sought a replacement.<sup>2</sup>

Pennsylvania Trusses

The design finally chosen in 1914 called for a 200 foot Pennsylvania main span with a 16 foot roadway (see Figures 5-8). The Pennsylvania truss was a "major advance in strengthening the Pratt truss," which had become one of the two predominant truss types in the United States in the late 19th century. The

Pennsylvania's distinctive features, an inclined top chord for economy of material and panel subties or substruts for greater strength, were a response to the increasing live loads of railroad locomotives and rolling stock. This style truss is generally found in the United States with lengths of 250 to 600 feet.<sup>3</sup> None of Wisconsin's Pennsylvanias are of such length, however, and in this state the Hemlock Bridge is not unusually short. Wisconsin's remaining Pennsylvania trusses are listed in Figure 1. Figures 2 and 3 provide a structural comparison, and Figure 4 gives loading comparisons. Figure 9 shows a 180 foot Parker designed in 1913.

Three of Wisconsin's other five Pennsylvanias are also of historical interest. The Melrose Bridge, designed by the SHC in 1920, was officially determined eligible for the National Register in 1978. The Cobban Bridge, built in 1908, and the Bridgeport Bridge, built in 1931, may be eligible.<sup>4</sup>

#### Wisconsin State Highway Commission

When the town board of Warner township sought to replace the bridge at Hemlock in 1914, it faced a very different situation than it had 20 years before. Although it probably wanted a bridge "just like" the one that the flood had carried off, advances in highway bridge construction made such a choice unwise, and changes in the state law made it impossible. The automobile age was increasing load requirements for highway bridges; riveted construction was replacing pinned; and a new state agency, the Wisconsin State Highway Commission, was promoting higher standards in bridge design and construction.

In 1894, highway bridge work had been a matter between local officials and bridge companies. Towns initiated projects by voting one half the expected

cost and then petitioned the county for the other half. Plans and bids were sought from a variety of builders, but most local officials were interested only in the lowest initial cost. Neither the towns nor the reputable bridge companies benefited from this arrangement, where the "governing considerations were those of salesmanship and not engineering." The system had too often resulted, critics said, in "a poorly designed and rather weak bridge erected at a high price."<sup>6</sup>

A concern for better bridges was part of a much wider good roads movement.<sup>7</sup> That movement had led to the establishment of a State Highway Division in 1907. The Division was superceded in 1911 by a much stronger and more ambitious State Highway Commission (SHC).<sup>8</sup> By providing professional engineering advice to counties and towns, the SHC sought to help them choose better designed bridges at a better price. By providing them a set of standard plans, or requiring minimum standards on plans drawn by others, the Commission sought to establish sound engineering principles and a fair bidding process.<sup>9</sup> It believed, however, that it should allow local officials some discretion, and the Hemlock Bridge is an example of the SHC's flexibility.<sup>10</sup> At the request of Warner Township, the SHC inspected the site and provided plans on which the town could seek bids, but these plans were neither the SHC's initial recommendation, nor a progressive innovation. Indeed, in the subsequent Biennial Report what the SHC highlighted (no doubt for the benefit of cost conscious officials in other towns) was that the approach spans were "especially designed to utilize steel beams" from the previous structure at the site.<sup>12</sup>

Still, the Hemlock's design was not a capitulation to the old system, but a modification of the SHC's current standard plans.<sup>13</sup> The Hemlock's plan has the same boiler plate format, with a general (or "generic") title in the lower right hand corner and a drawing of the expansion bearing included.<sup>14</sup> More importantly, the plan features the same riveted construction with angles instead of eyehars for the bottom chord and the lateral bracing. The loading computations are done in the same manner: the live load is divided into the uniform load, which was given as pounds per square foot, and the concentrated load, which was given as a "15 ton roller as shown on drawing N402." This latter drawing was a relatively recent addition to the standard plans.<sup>15</sup>

Diagrams of the roller nest expansion bearings were also a recent addition to the standard plans, although rollers were listed on standard plans as early as 1912. The roller nest works well when new but it tends to develop flat spots on the rollers and dips in the plates. It is impossible to seal effectively, even when filled with oil as the SHC plans called for, and it has numerous small parts which collect dirt and water. Hence, they tend to rust, deteriorate, and jam.<sup>16</sup> The Hemlock roller bearings are rusted and hurried, and no longer function properly.<sup>17</sup> Late in 1914 the SHC introduced a new innovation, the pinned rocker, to overcome these problems, but this new bearing would not replace rollers entirely until the 1920's.<sup>18</sup>

Two other features of the Hemlock's design would also be changed on later SHC designs. The system of subties such as the Hemlock's design called for was more common, according to a 1905 texthook, than that of substruts. Common or not, J. A. L. Waddell asserted in a book first published in 1916 that subties were not preferred because they produced greater secondary stresses and

vibrations.<sup>19</sup> The SHC continued to prefer subtles, however, until it designed the Bridgeport Bridge in 1930.<sup>20</sup> The Hemlock Bridge had another feature of which the outspoken Mr. Waddell also disapproved: suspended floor beams. That was a detail, he wrote in 1921, "which very properly has gone out of fashion." Here the SHC was quicker to follow Waddell's preferences, although for a period of time it continued to design bridges with floor beams below the bottom chord.<sup>21</sup>

The first compromise of its current preferences that the SHC had to make on the Hemlock Bridge was on span length. Although short by national standards, the Hemlock Bridge was 20 feet longer than any known previous SHC designs. For long crossings the SHC generally recommended using multiple span bridges with piers in the water, and the Commission did propose a two span bridge for this crossing at Hemlock.<sup>22</sup> For the town board, however, the memory of their old bridge or of the flood that took it out was, presumably, too strong; they preferred another 200 foot clear span.<sup>23</sup> The extra length required a related compromise, and no doubt the hardest one for the SHC to make. The Commission was staunchly advocating reinforced concrete floors for all bridges, but the greater weight of concrete meant there was an upper limit on the span length, beyond which "the use of concrete floors is uneconomical."<sup>24</sup> Although the SHC did design a 180 foot overhead truss with a concrete floor in 1913, a wood floor on the Hemlock Bridge would weigh a fraction of that of a concrete one.<sup>25</sup> A final irony here is that the town could not (or would not) pay for the carefully designed creosoted wood block floor and substituted instead a temporary plank floor.<sup>26</sup> On the one hand this was a further compromise of SHC standards of durability, and on the other hand it would have considerably increased the uniform load capacity of 50 pounds per square foot.<sup>27</sup>

The design of the Hemlock Bridge, then, is an example both of the principles of good engineering which the SHC sought to promote and of the practical compromises it had to make. It is a rather efficient bridge compared to other SHC Pennsylvanias (see Figure 4), but it is not a typical example of any one age. Rather, it is mainly representative of the coming era of the standardized automobile bridge, but with important aspects of the past era of the idiosyncratic wagon bridge. Perhaps the Hemlock Bridge is most valuable precisely because it is an example of the dynamic interaction between the engineer and the politician and between proven practice and professional innovation.

#### Wausau Iron Works

Another actor in this process is the bridge builder, but Wausau Iron Works' role in the negotiations about the Hemlock's design is not known.<sup>28</sup> The company was started in 1907 as a branch of Northern Boiler and Iron Works of Appleton.<sup>29</sup> In 1908 two brothers, Tony and John Heinzen, bought the facilities and incorporated as the Wausau Iron Works with the manufacture of boilers as the principal business. In 1910 the company entered into the field of bridge fabricating and erection and was able to compete successfully with the large Milwaukee firms. That same year it built a 20,000 square foot facility which it expanded in 1916 and again in 1930. In 1919 the company went into concrete paving as an extension of its bridge erecting business. The firm added snowplows in the 1920's through a subsidiary arrangement with E. A. Drott, the state sales representative for Caterpillar Tractors. According to one source, Wausau Iron dropped its bridge erection and concrete paving business in 1933 and concentrated on snow plows, steel warehousing and structural steel fabricating. Bridge plans by Wausau Iron, however, have been found at least as late as 1951.<sup>30</sup>

### The Village of Hemlock

It would appear that the least significant element in the history of the Hemlock Bridge was the Village of Hemlock. Hemlock Island, now washed away, was an early topographic feature on this stretch of the Black River.<sup>31</sup> The island gave its name first to a logging dam and later to the village that grew up around the dam. The dam, built by the Black River Improvement Company in 1879, was one of two flooding dams the company placed on the Black River. These dams were intended to facilitate the running of logs past downstream rapids, but they also provided power for mills.<sup>32</sup> Niran Withee, a prominent lumherman and political leader in La Crosse and Clark Counties from 1852 until his death in 1887, built two mills at Hemlock: a four story grist mill, which had three mill stones, and a two story saw mill, which had both a rotary and an upright saw. C. G. Reul built a shingle mill in 1880, with a capacity of 80,000 shingles per day.<sup>33</sup>

At one time Hemlock was said to be "quite a thriving hamlet," with a post office, hoarding house, store, house, two "shanties," and the impressive home of Theordore Withee, Niran's son. The lumber frontier moved on, however, and the "village" was barely a hamlet even before the flood of June 1914 carried out the dam and the hridge below it. By 1918, Hemlock was referred to as "an abandoned village". By then only the ruined dam, deserted buildings, and a new steel bridge marked its spot.<sup>34</sup>

FOOTNOTES

1. Clark County Centennial Corp., The Book of Years; The Story of the Men Who made Clark County (Neillsville, Wis., 1953), F-19. (for a note on this book's pagination, see page F-10).
2. Centennial Corp., Book of Years, F-16 to F-19; Wisconsin Highway Division, "Inspection Report," May 30, 1908, Wisconsin Highway Commission, "Bridge Survey Report," June 22, 1914; Clark County Board of Supervisors, Proceedings, November 14, 1894, 15; January 10, 1895, 37; January 7, 1896, 23.
3. American Association for State and Local History Technical Leaflet 95, History News, Vol. 32, No. 5, May 1977: T. Allan Comp and Donald Jackson, "Bridge Truss Types: A Guide to Dating and Identifying," 5,6-7. See also J. A. L. Waddell, Bridge Engineering (New York, 1921 (1916)), 25, 268, 469, 478; Economics of Bridgework (New York, 1921), 176, 177; J. B. Johnson, C. W. Bryan, and F. E. Turneaure, The Theory and Practice of Modern Framed Structures (New York, 1905, (1893)), 275; Milo S. Ketchum, The Design of Highway Bridges (New York, 1908), 212; Henry G. Tyrrell, History of Bridge Engineering (Chicago, 1911), 184-192.
4. Both the Cobban and Bridgeport Bridges have been evaluated by the Wisconsin Department of Transportation's Historic Bridge Advisory Committee and found to be worthy of "further consideration." A final decision is forthcoming. There is little question on the Cobban Bridge. See Charlene Olson, "Crusade to Save Cobban Bridge Leads to Historical Trail," Chippewa Herald-Telegram, Chippewa Falls, Wisconsin, December 11, 1982. The SHPO has determined that the Radke bridge does not meet the criteria; P10-0266 is not 50 years old.
5. SHC, "Bridge Inspection Report", June 22, 1914. For a discussion of the general SHC policy in advising local officials see, SHC, Second Biennial Report, July 1, 1911 to January 1, 1915 (Madison, 1915), 17-18, 21; see also note 8, below.
6. The quotations are from SHC, Fifth Biennial Report, 1922-24 (Madison, 1924), 70 and SHC, Second Biennial Report, 30. On the Bridge law generally see SHC, Fifth Biennial Report, 73; Wisconsin Geological and Natural History Survey, Road Pamphlet No. 5 Highway Division, "First Biennial Report" (Madison, 1909, 47 and M. F. Davis et al., eds., A History of Wisconsin Highway Development, 1835-1945 (Madison, 1945), 16-17.
7. Davis, Wisconsin Highway Development, 20, 24; Ballard Campbell, "The good Roads Movement in Wisconsin, 1880-1911", Wisconsin Magazine of History, Summer 1966, 49: 273-293.
8. The Highway Division was placed in the Wisconsin Geological and Natural History Survey which had been testing road materials for several years. See Campbell, "Good Roads Movement," 287, Highway Division, First Biennial Report, especially 3-7, 12-16, 36-46, 50-51; SHC, Preliminary Biennial Report on State Road Construction (Madison, 1913), 5. The most ambitious aspect of the SHC's programs, direct state aid for highway improvements, required a constitutional amendment. Campbell, "Good Roads Movement," 283, 288.

9. See note 6, above, and SHC, Second Biennial Report, 24. The Commission drew up plans for I-Beam, reinforced concrete, girder, and truss bridges. The initial truss bridge set was for spans of 35 to 180 feet, generally in 5 foot increments. In 1914, the longest four (160, 168, 171 and 180 feet) were dropped.
10. SHC, Second Biennial Report, 17-18, 24. It would appear from the Hemlock case, that the SHC granted local officials "discretion" on SHC's plans as well as on those prepared by others.
11. SHC, "Bridge Inspection Report", June 22, 1914.
12. SHC, Third Biennial Report, January 1, 1914 to January 1, 1916, Madison, 1916, 91. The early biennial reports were important promotional documents for the SHC. The Third Biennial Report, for example, has 135 photographs showing examples of good quality SHC improvements or abysmal prior conditions.
13. The SHC revised its truss bridge standard plans in 1914. Although A 26 is a Parker design, and it was dropped from the set in the 1914 revisions, it is included in the comparisons in the figures because it is the longest standard design overhead truss known to have been prepared by the SHC and because it was designed only one year before the Hemlock. See Wisconsin Department of Transportation (WisDOT), Bridge Section, Microfilm Reel M-1.
14. WisDOT Microfilm Reel M-2, Frames M373, M374,; Reel M-7, Frame N673, N674. The expansion bearing is not shown on A 19, a 150 foot Camelback, dated January 31, 1912 nor on A 26, the 180 foot Parker mentioned previously and dated August 28, 1913. WisDOT, Microfilm Reel M-1.
15. N402 was apparently drawn between January 1912 and August 1913. See note 14, above. No impact loadings were computed. The first plan found with impact loadings was that for the Bridgeport Bridge. See WisDOT Microfilm Reel P-7, Frame 3432.
16. Transportation Research Board, Report No. 41, Bridge Bearings (Washington, D.C.), 17-21.
17. WisDOT, "Annual Bridge Inspection Report", August 29, 1979; Robert S. Newbery, Staff Historian, WisDOT, Field Inspections, September 1, December 21, 1982.
18. See plans A 52 through A 60 dated 1920 and B 16 dated March 1, 1921.
19. Johnson, Bryan and Turneaure, Modern Framed Structures, 77. Turneaure was the Dean of the College of Engineering at the University of Wisconsin, and a member of the SHC from its beginning. Waddell, Bridge Engineering, 469-70. Waddell was a prominent bridge engineer in the late 19th and early 20th centuries, and author of many books and articles on the subject. Note that both the Melrose and the Radke bridges have subties. See Figures 1 and 2.
20. WisDOT, Microfilm Reel P-7, Frames 3431-3432.

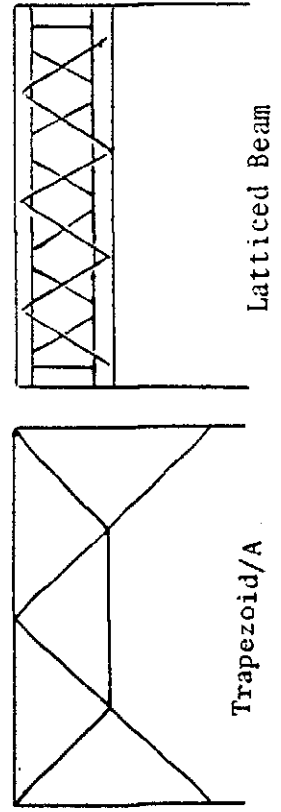
21. Waddell, Economics of Bridgework, 176. Although Waddell no doubt was most scornful of floor beams hung by U-bolts or other means, and not just attached below the bottom chord, his comment is in the context of a discussion of appropriate truss depth. The earliest SHC bridge with floor beams above the bottom chord appears to be the 1916 Kleiman Bridge in Marathon County (no longer in existence). It was a 75 foot Warren pony truss. See WisDOT, Microfilm Reel M-7, Frame N 1182. The 1920 revisions had floor beams below (see note 18 above); the Melrose Bridge has floor beams above. According to Ketchum, "To make a stiff structure, the depth should be sufficient to have the floor beams above the lower chords...", Design of Highway Bridges, 220. See also ibid, 269-70.
22. SHC, Second Biennial Report, 24; Highway Division, "First Biennial Report," 38; SHC, "Bridge Inspection Report," June 22, 1914. Three items appear to be interrelated here in the SHC's general preferences. The SCH believed very much that reinforced concrete was the superior building material. It may have preferred multiple spans partly because shorter spans are proportionally more efficient than longer ones and partly because concrete floors weighed so much. Finally, Wisconsin's topography, in general, presented few truly difficult crossings which made piers impossible. See Johnson, Bryan, and Turneure, Modern Framed Structures, 271-272, for a formula for determining the cost effectiveness of shorter spans with piers versus longer, clear spans. See J. A. L. Waddell, The Designing of Ordinary Iron Highway Bridges (New York, 1891) 32, for a discussion of the proportionally lighter requirements for a longer span.
23. It was indeed an impressive flood. See Centennial Corp., Book of Years, F-17, for a photograph.
24. Wisconsin Geological and Natural History Survey, Road Pamphlet No. 4, Second Edition (Highway Division, "Bridges and Culverts" (Madison, 1909), 52. The limit at that time, wrote the Division, was about 125 feet.
25. Martin W. Torkelson was the Bridge Engineer for the Highway Division and the SHC. A concrete floor would have weighed approximately 1150 pounds per lineal foot, and the wood block floor, as the SHC designed it approximately 510 pounds per lineal foot. The wood plank floor may have weighed as little as 200 pounds per lineal foot. See ibid, and WisDOT, Microfilm Reel M-2, Frame 374.
26. SHC, Second Biennial Report, 20-21.
27. DOT, Microfilm Reel M-2, Frame M374; Waddell, Iron Highway Bridges, 5-6, recommended a uniform load capacity of 60 pounds per square foot, even for lightly traveled rural bridges of this length.
28. Wausau Iron Works presumably added another element as well: that of the capitalist. It would be interesting to know, for example, what Wausau thought of the wooden floor. Unfortunately, no correspondence from Wausau was located and even the Clark County Board Proceedings, which would have provided only meager information anyway, are missing for 1914-1915.

29. The following paragraphs are a very close paraphrase of the two page memo, "LOED Corporation History," September 4, 1975, provided to Bill Duckert of Barrientos & Associates by the LOED Corporation. Copies of this report have been sent to SHSW for filing with the Emil Krienke Collection. Mr. Krienke was a bridge construction crew supervisor with Wausau Iron Works. See also, George Danko, "The Development of the Truss Bridge, 1820-1930, with a Focus Toward Wisconsin," State Historic Preservation Office, SHSW, August 27, 1976, 20.
30. The source is the "LOED Corporation History," op cit. The later bridge plans were for B-61-014 in Trempealeau County. According to one resident of Levis Township in Clark County, Wausau Iron built P-10-266 on River Road in Section 4 of that township. Newbery, Field Inspection, December 21, 1982. According to WisDOT files, P-10-266 was built in 1938. Bridge Section, Bridge Inspection Report File.
31. Snyder and Van Vechten, Historical Atlas of Wisconsin (Milwaukee 1878), 107.
32. Franklyn Curtiss-Wedge, History of Clark County, Wisconsin (Chicago, 1918), 664-5; Centennial Corp., Book of Years, F-15; Satterlee, Tifft, and Marsh, Clark County, The Garden of Wisconsin (Neillsville, Wis., 1890), 53-4.
33. Curtiss-Wedge, History of Clark County, 123, 317-18, 664.
34. Centennial Corp., Book of Years, F-19; State Historical Society of Wisconsin, Archives Reading Room, "Post Office File"; Curtiss-Wedge, History of Clark County, 318, 665. A postal route map dated 1911 shows approximately 12 structures at Hemlock. Post Office Department, Map of Clark County.

Figure 2  
STRUCTURAL COMPARISON WISCONSIN PENNSYLVANIA TRUSSES

	panels	panel length	type of connection	portal type	subties	substruts	hip vertical	panel vertical	floor beam connection	portal	panel point 2	panel point 3	panel point 4	panel point 6
Cobban	12	20.1	Pinned	Latticed Beam (knee brace)	X	X	2Ls 2½ x 3½ x 3/16 8"	2[s 6" 8"	above	20	30	34	38	-
Hemlock	12	16.7	Riveted	Trapezoid/A	X		2[s 6" 8"	2[s 6" 8"	below	20	29	NA	35	-
Melrose	12	16.7	Riveted	Latticed Beam (curved knee brace)	X	X	2[s 6" 8.2#	2[s 6" 8.2#	above	22	28	NA	34	-
Radke	12	16.7	Riveted	Trapezoid/A <sup>2</sup> (laced)	X		2[s 6" 8.2#	2[s 6" 8.2#	above	22	28	NA	34	-
Bridgeport	14	16.5	Riveted	Trapezoid/A <sup>2</sup> (laced)	X	X	2[s 7" 9.8#	2[s 7" 9.8# 9" 13.4#	above	23	28	NA	34	36
P10-266	12	16.7	Riveted	Trapezoid/A	X		2[s Dimensions NA	2[s	below	NA	NA	NA	35	-

1 Portal Diagrams



2 Portal later modified to raise vertical clearance; the legs of the "A" were removed.

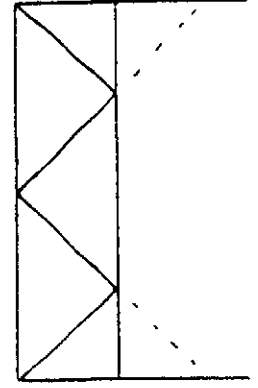


Figure 1. Pennsylvania Trusses in Wisconsin

<u>Year</u>	<u>SPL</u> <sup>1</sup>	<u>RDW</u> <sup>2</sup>	<u>VCL</u> <sup>3</sup>	<u>Road On</u> <sup>4</sup>	<u>River Crossed</u>	<u>Manufacturer/Builder</u>	<u>Township</u>	<u>County</u>	
Cobban	1908	2@241	15.7	12.4	CTH 'T'	Chippewa	Modern Steel Structures Co.	Arthur/ Eagle Point	Chippewa
Hemlock	1914	200	15.0	14.1	Warner Dr.	Black	Wausau Iron Works	Warner	Clark
Melrose	1921	200	19.0	14.1	STH 71&108	Black	Worden Allen	Melrose	Jackson
Radke	1925	200	19.0	14.3	STH 60	Kickapoo	Illinois Steel Bridge Co. & Minneapolis Bridge Co.	Wauzeka	Crawford
Bridgeport	1930	7@232 <sup>5</sup>	23.0	14.9 to 15.1	USH 18& STH 35	Wisconsin	Stevens Bros. St. Paul, Minnesota	Wyalusing	Crawford Grant
P 10-266 <sup>6</sup>	1938 <sup>7</sup>	200	15.0	16.0	River Rd.	Black	Unknown <sup>8</sup>	Levis	Clark

<sup>1</sup> Does not include approach spans.

<sup>2</sup> Roadway width.

<sup>3</sup> Vertical clearance.

<sup>4</sup> USH: U.S. Highway; STH: State Trunk Highway; CTH: County Trunk Highway.

<sup>5</sup> 232' is the average span length. The precise lengths vary from 231.3 to 232.9'. One span is across a slough and is 1/4 mile south of the other 6.

<sup>6</sup> No name has been found for this bridge yet. All bridges in Wisconsin have such an ID number.

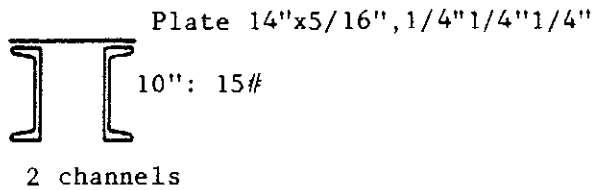
<sup>7</sup> From Bridge Inspection Report files. No confirming source located yet. This could be the date it was moved to this site.

<sup>8</sup> May be Wausau Iron Works.

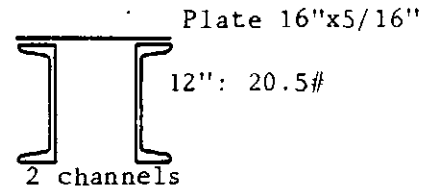
Figure 3. Member Configuration of Selected SHC Designed Bridges

a. Top Chord

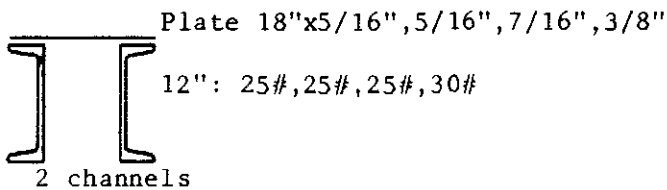
Hemlock



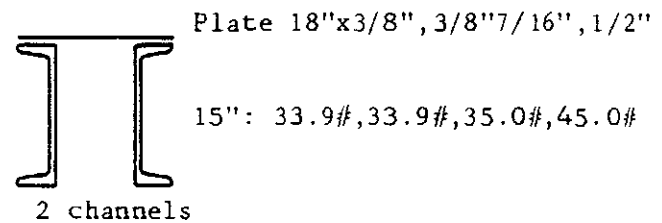
A-26 (1913 Parker)



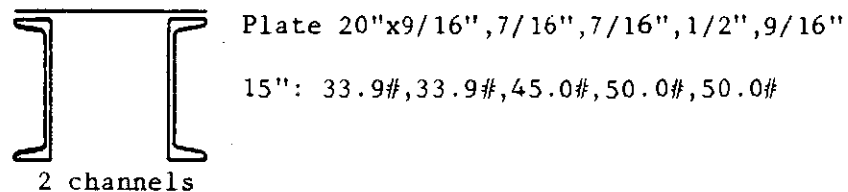
Melrose



Radke



Bridgeport



b. Bottom Chord

	<u>Panel 1</u>	<u>Panel 2</u>	<u>Panel 3</u>	<u>Panel 4</u>	<u>Panel 5</u>	<u>Panel 6</u>	<u>Panel 7</u>
Hemlock	2 Ls 3½x2½x½	2 Ls 3½x2½x½	2 Ls 4x3x½	2 Ls 4x3x½	2 Ls 6x3½x½	2 Ls 6x3½x½	
A 26	4 Ls 5x3x5/16	4 Ls 5x3x5/16	4 Ls 5x3½x3/8	4 Ls 5x3½x7/16	4 Ls 5x3½x½		
Melrose	4 Ls 4x3x3/8	4 Ls 4x3x3/8	4 Ls 4x3x9/16	4 Ls 4x3x9/16	4 Ls 6x3½x9/16	4 Ls 6x3½x9/16	
Radke	4 Ls 5x3½x9/16	4 Ls 5x3½x9/16	4 Ls 6x3½x9/16	4 Ls 6x3½x9/16	4 Ls 6x4x3/4	4 Ls 6x4x3/4	
Bridgeport	8 LS 4x3x5/16	8 LS 4x3x5/16	8 LS 4x3x½	8 LS 4x3x½	8 LS 6x4x½	8 LS 6x4x½	6x4x9/16

<sup>1</sup> Although A26 is a Parker, it was the longest SHC design at that time.

Figure 4. Loading for Selected SHC Designed Bridges

a. Top Chord

		<u>Panel 1</u>	<u>Panel 2</u>	<u>Panel 3</u>	<u>Panel 4</u>	<u>Panel 5</u>
<b>HEMLOCK<sup>1</sup> 8/26/14</b>						
SPL: 200	Dead Load <sup>1</sup>	71,500	65,100	77,300	85,700	
RDW: 16	Ratio to Panel 1	-	.91	1.08	1.20	
Panels: 12	Live Load	47,900	43,600	51,800	57,400	
Wood block floor	Ratio to Panel 1	-	.91	1.08	1.20	
	LL/DL	.67	.67	.67	.67	
<b>A-26 (Parker)<sup>2</sup> 8/23/13</b>						
SPL: 180	Dead Load	141,500	140,200	156,200	168,500	173,500
RDW: 18	Ratio to Panel 1	-	.99	1.10	1.19	1.23
Panels: 10	Live Load	49,000	48,500	54,000	58,200	60,800
Concrete floor	Ratio to Panel 1	-	.99	1.10	1.19	1.24
	LL/DL	.35	.35	.35	.35	.35
	DL ratio to Hemlock	1.98	2.15	2.02	1.97	
	LL ratio to Hemlock	1.02	1.11	1.04	1.01	
<b>MELROSE 11/23/21</b>						
SPL: 200	Dead Load	158,700	145,600	194,900	214,200	
RDW: 20	Ratio to Panel 1	-	.92	1.23	1.35	
Panels: 12	Live Load	65,600	60,200	80,500	88,500	
Concrete floor	Ratio to Panel 1	-	.92	1.23	1.35	
	LL/DL	.41	.41	.41	.41	
	DL ratio to Hemlock	2.22	2.24	2.52	2.50	
	LL ratio to Hemlock	1.37	1.38	1.55	1.54	
<b>RADKE 8/15/25</b>						
SPL: 200	Dead Load	165,800	152,000	211,000	224,000	
RDW: 19	Ratio to Panel 1	-	.92	1.27	1.35	
Panels: 12	Live Load	104,300	95,900	156,000	237,900 <sup>3</sup>	
Concrete floor	Ratio to Panel 1	-	.92	1.50	2.28	
	LL/DL	.63	.63	.74	1.06	
	DL ratio to Hemlock	2.32	2.33	2.73	2.61	
	LL ratio to Hemlock	2.18	2.20	3.01	4.14	
	DL ratio to Melrose	1.04	1.04	1.08	1.05	
	LL ratio to Melrose	1.59	1.59	1.94	2.69	
<b>BRIDGEPORT 4/19/30</b>						
SPL: 231	Dead Load	248,000	228,500	306,000	341,500	355,000
RDW: 23	Ratio to Panel 1	-	.92	1.23	1.38	1.43
Panels: 14	Live Load	106,200	98,000	131,200	146,400	152,200
Concrete floor	Ratio to Panel 1	-	.92	1.23	1.38	1.43
	Impact Load	18,700	17,200	23,000	25,700	26,700
	Ratio to Panel 1	-	.92	1.23	1.37	1.43
	LL/DL	.43	.43	.43	.43	.43
	DL ratio to Hemlock	3.50	3.51	3.96	3.99	
	LL ratio to Hemlock	2.22	2.25	2.53	2.55	
	DL ratio to Melrose	1.56	1.57	1.57	1.59	
	LL ratio to Melrose	1.62	1.63	1.63	1.65	
	DL ratio to Radke	1.50	1.50	1.45	1.52	
	LL ratio to Radke	1.02	1.02	.84	.62	

<sup>1</sup> Dead Load is as designed, not as built. See discussion in text.

<sup>2</sup> Although A-26 is a Parker it was the longest SHC design at that time.

<sup>3</sup> This is the figure on the plan, but it does seem excessive.

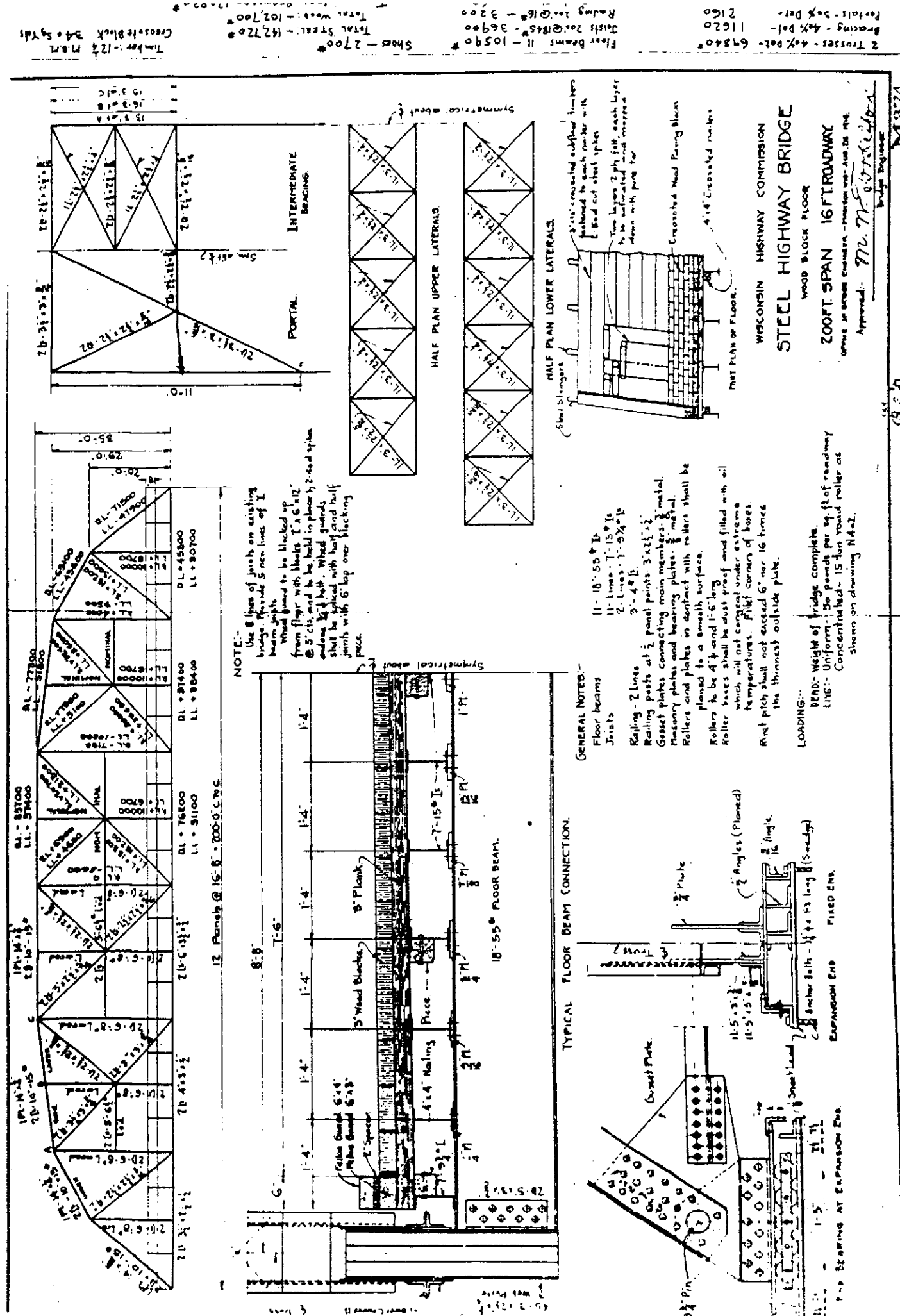
Figure 4. Loadings for Selected SHC Designed Bridges

b. Bottom Chord

	<u>Panel 1&amp;2</u>	<u>Panel 3&amp;4</u>	<u>Panel 5&amp;6</u>	
Hemlock 8/26/14				
Dead Load	45,800	57,400	76,200	
Ratio to Panel 1	-	1.25	1.66	
Live Load	30,700	38,400	51,100	
Ratio to Panel 1	-	1.25	1.66	
LL/DL	.67	.67	.67	
	<u>Panel 1&amp;2</u>	<u>Panel 3</u>	<u>Panel 4</u>	<u>Panel 5</u>
A 26 (Parker) 8/23/13				
Dead Load	94,800	134,700	152,500	168,500
Ratio to Panel 1	-	1.42	1.61	1.78
Live Load	32,800	46,600	52,800	58,300
Ratio to Panel 1	-	1.42	1.61	1.78
LL/DL	.35	.35	.35	.35
DL ratio to Hemlock	2.06	2.35	2.66	2.21
LL ratio to Hemlock	1.06	1.21	1.38	1.14
	<u>Panel 1&amp;2</u>	<u>Panel 3&amp;4</u>	<u>Panel 5&amp;6</u>	<u>Panel 7</u>
Melrose 11/23/21				
Dead Load	95,900	137,000	180,500	
Ratio to Panel 1	-	1.43	1.88	
Live Load	39,700	56,600	74,600	
Ratio to Panel 1	-	1.43	1.88	
LL/DL	.41	.41	.41	
DL ratio to Hemlock	2.09	2.39	2.37	
LL ratio to Hemlock	1.29	1.47	1.46	
Radke 8/15/25				
Dead Load	100,000	143,000	188,500	
Ratio to Panel 1	-	1.43	1.89	
Live Load	63,200	99,450	163,800	
Ratio to Panel 1	-	1.57	2.59	
LL/DL	.63	.70	.87	
DL ratio to Hemlock	2.18	2.50	2.47	
LL ratio to Hemlock	2.06	2.60	3.21	
DL ratio to Melrose	1.04	1.04	1.04	
LL ratio to Melrose	1.59	1.76	2.20	
Bridgeport 4/19/30				
Dead Load	144,500	237,500	316,000	355,000
Ratio to Panel 1	-	1.64	2.19	2.46
Live Load	62,000	101,700	135,400	152,200
Ratio to Panel 1	-	1.64	2.18	2.46
Impact Load	10,900	17,900	23,800	26,700
Ratio to Panel 1	-	1.64	2.18	2.45
LL/DL	.43	.43	.43	.43
DL ratio to Hemlock	3.16	4.14	4.15	
LL ratio to Hemlock	2.02	2.65	2.65	
DL ratio to Melrose	1.51	1.73	1.75	
LL ratio to Melrose	1.56	1.80	1.82	
DL ratio to Radke	1.45	1.66	1.68	
LL ratio to Radke	.98	1.02	.83	



Figure 5 (See also Photograph No. 16 for a copy made directly from the Microfilm)



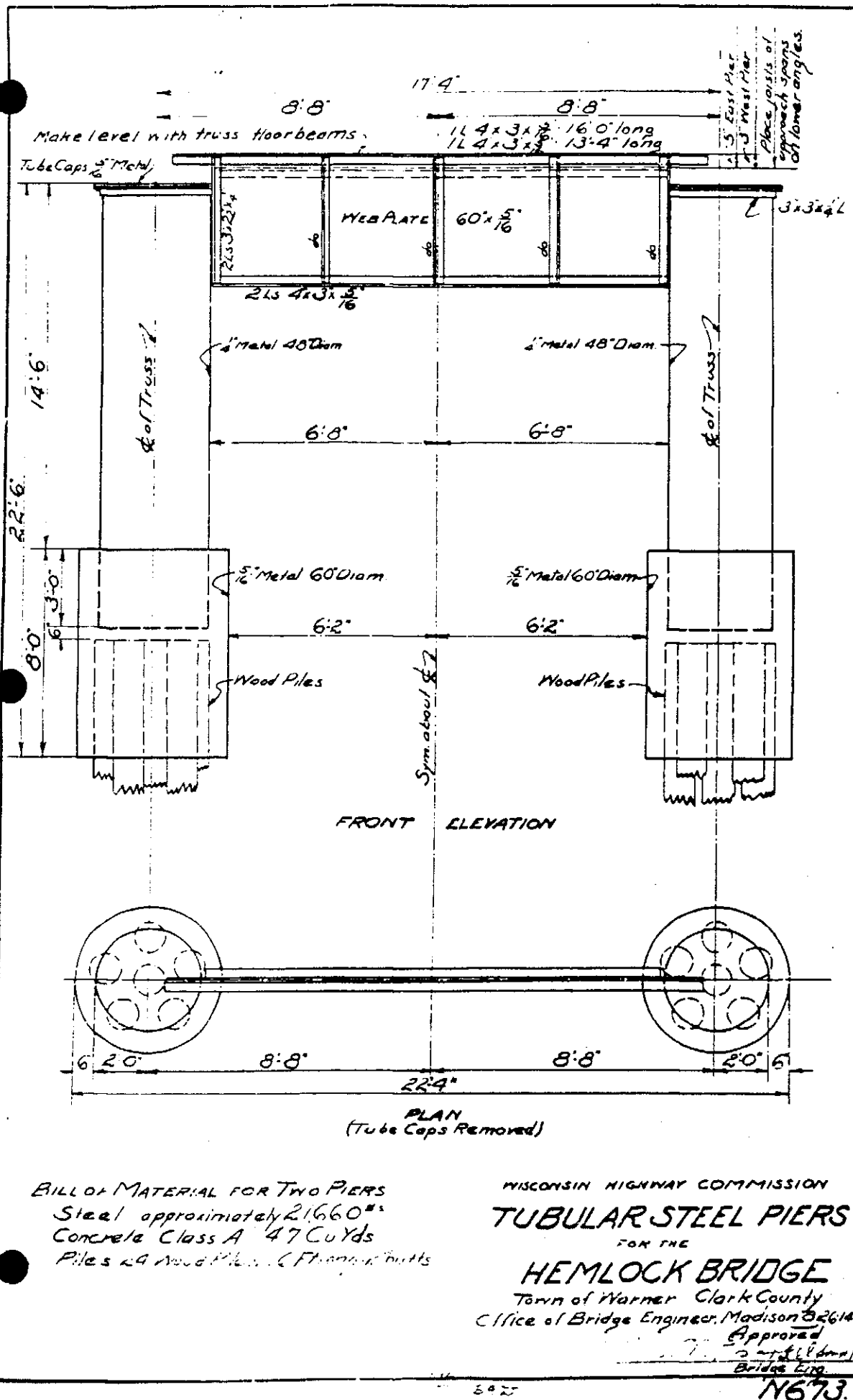
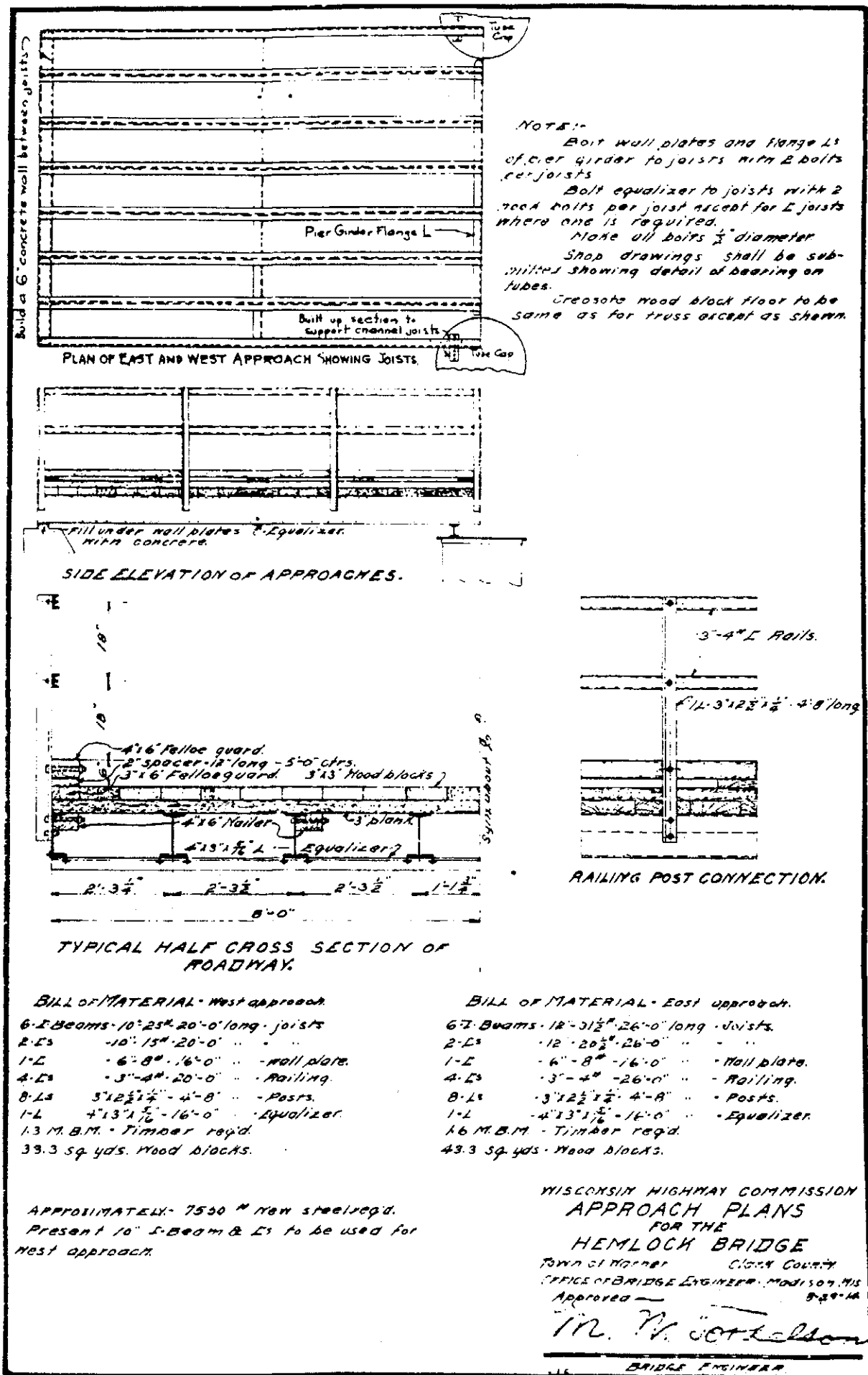
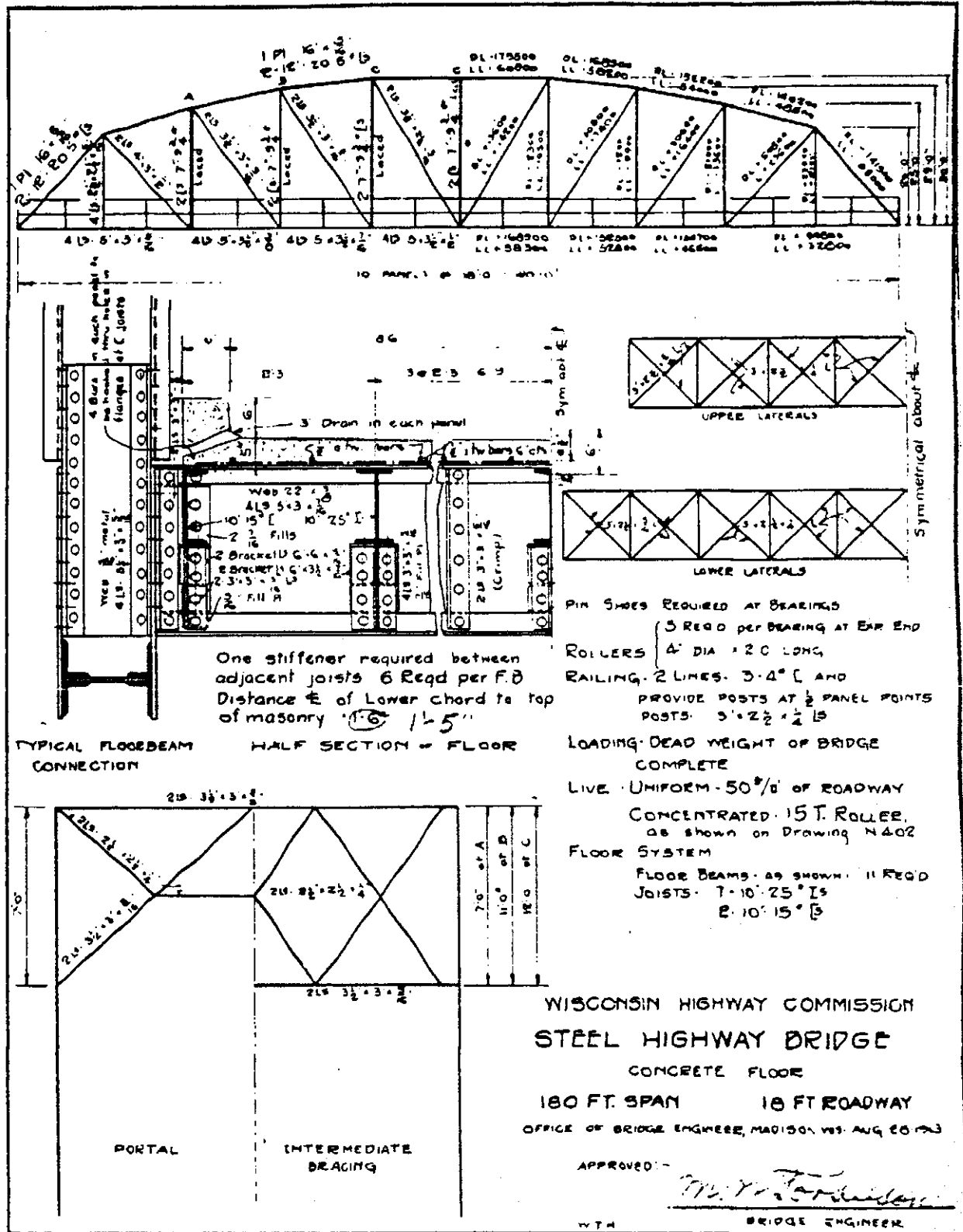


Figure 7 (See also Photograph No. 18 for a copy made directly from Microfilm)

(See also Photograph No. 19 for a copy made directly from Microfilm)





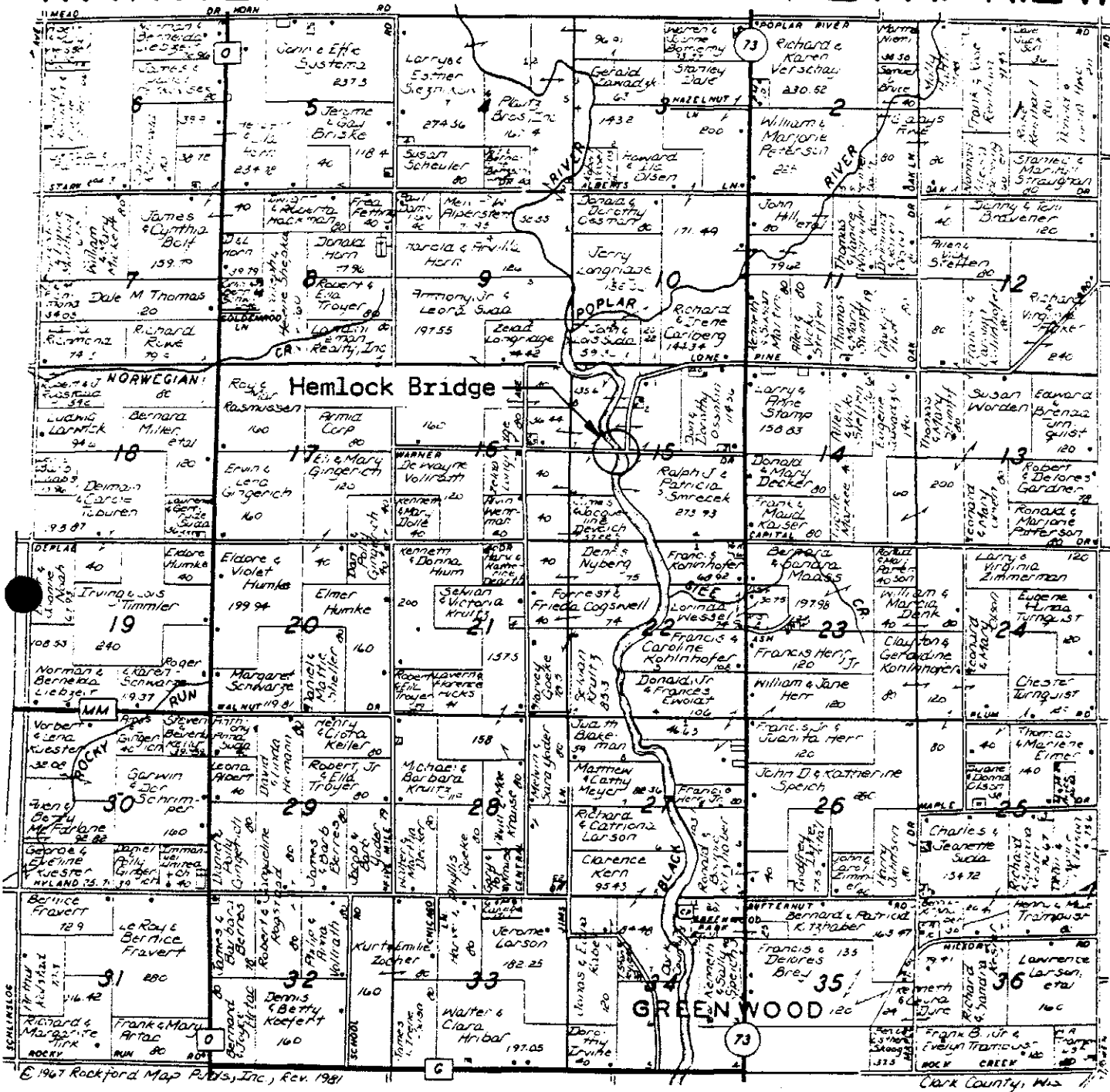
A 26.

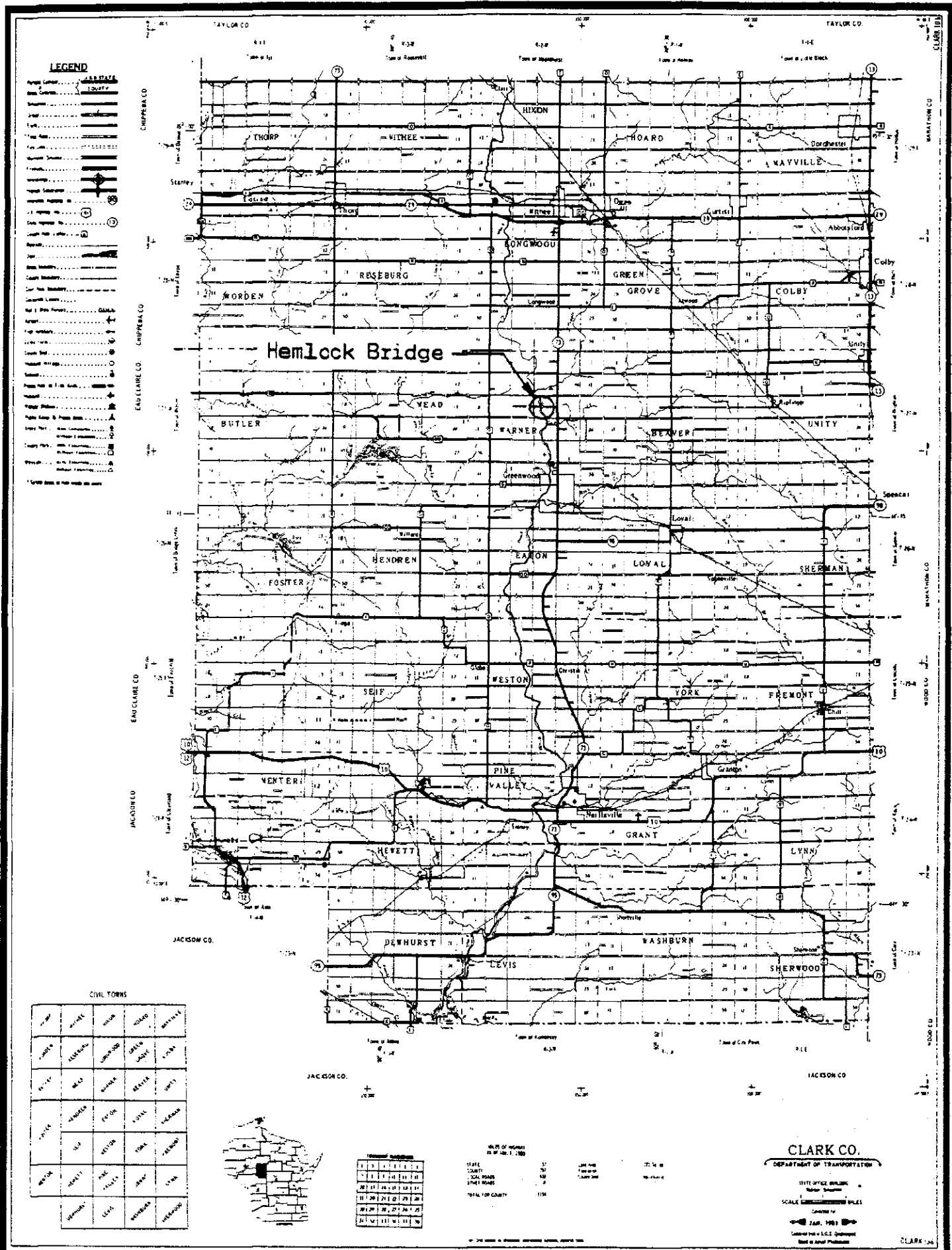
Trusses - 40% Det	77200 *	Joists	36900 *	Total Steel	116170 *
Floor beams	20900	Railing & Posts	3460	Concrete -	58.30 cu Yds
Laterals	4450	Reinf	7960		1:2.4 MIX
Portals & Bracing	10200		48320 *		
	112750 *				

Figure 9

# WARNER

T. 27N.-R.2W.





RIVER

Hemlock Bridge  
HAER No. WI-5  
(Page 25)

Gravel Pit

Hemlock

Hemlock Bridge

Gravel Pit

RIVER

W A R N E R

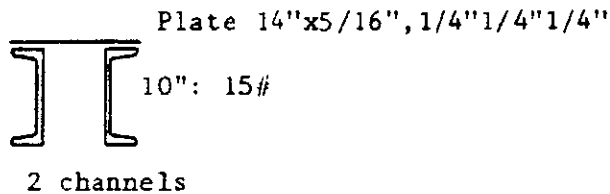
GULF

24

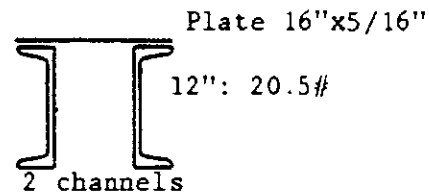
Figure 3. Member Configuration of Selected SHC Designed Bridges

## a. Top Chord

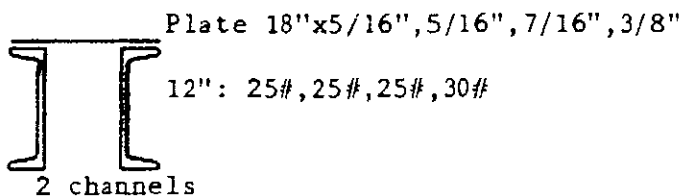
## Hemlock



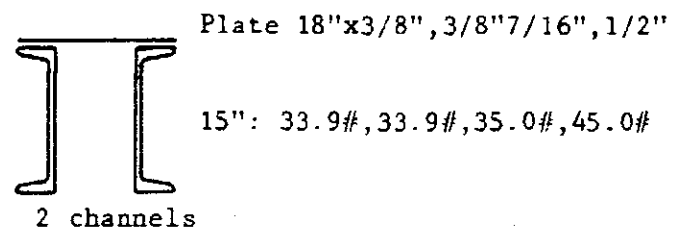
## A-26 (1913 Parker)



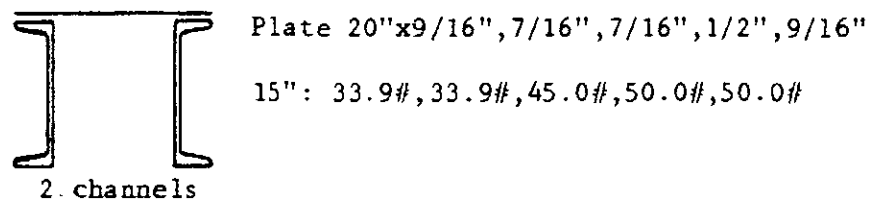
## Melrose



## Radke



## Bridgeport



## b. Bottom Chord

	<u>Panel 1</u>	<u>Panel 2</u>	<u>Panel 3</u>	<u>Panel 4</u>	<u>Panel 5</u>	<u>Panel 6</u>	<u>Panel 7</u>
Hemlock	2 Ls 3½x2½x½	2 Ls 3½x2½x½	2 Ls 4x3x½	2 Ls 4x3x½	2 Ls 6x3½x½	2 Ls 6x3½x½	
A 26	4 Ls 5x3x5/16	4 Ls 5x3x5/16	4 Ls 5x3½x3/8	4 Ls 5x3½x7/16	4 Ls 5x3½x½		
Melrose	4 Ls 4x3x3/8	4 Ls 4x3x3/8	4 Ls 4x3x9/16	4 Ls 4x3x9/16	4 Ls 6x3½x9/16	4 Ls 6x3½x9/16	
Radke	4 Ls 5x3½x9/16	4 Ls 5x3½x9/16	4 Ls 6x3½x9/16	4 Ls 6x3½x9/16	4 Ls 6x4x3/4	4 Ls 6x4x3/4	
Bridgeport	8 LS 4x3x5/16	8 Ls 4x3x5/16	8 Ls 4x3x½	8 Ls 4x3x½	8 Ls 6x4x½	8 LS 6x4x½	6x4x9/16

<sup>1</sup> Although A26 is a Parker, it was the longest SHC design at that time.

Figure 4. Loadings for Selected SHC Designed Bridges

b. Bottom Chord

	<u>Panel 1&amp;2</u>	<u>Panel 3&amp;4</u>	<u>Panel 5&amp;6</u>	
<b>Hemlock 8/26/14</b>				
Dead Load	45,800	57,400	76,200	
Ratio to Panel 1	-	1.25	1.66	
Live Load	30,700	38,400	51,100	
Ratio to Panel 1	-	1.25	1.66	
LL/DL	.67	.67	.67	
	<u>Panel 1&amp;2</u>	<u>Panel 3</u>	<u>Panel 4</u>	<u>Panel 5</u>
<b>A 26 (Parker) 8/23/13</b>				
Dead Load	94,800	134,700	152,500	168,500
Ratio to Panel 1	-	1.42	1.61	1.78
Live Load	32,800	46,600	52,800	58,300
Ratio to Panel 1	-	1.42	1.61	1.78
LL/DL	.35	.35	.35	.35
DL ratio to Hemlock	2.06	2.35	2.66	2.21
LL ratio to Hemlock	1.06	1.21	1.38	1.14
	<u>Panel 1&amp;2</u>	<u>Panel 3&amp;4</u>	<u>Panel 5&amp;6</u>	<u>Panel 7</u>
<b>Melrose 11/23/21</b>				
Dead Load	95,900	137,000	180,500	
Ratio to Panel 1	-	1.43	1.88	
Live Load	39,700	56,600	74,600	
Ratio to Panel 1	-	1.43	1.88	
LL/DL	.41	.41	.41	
DL ratio to Hemlock	2.09	2.39	2.37	
LL ratio to Hemlock	1.29	1.47	1.46	
	<u>Panel 1&amp;2</u>	<u>Panel 3&amp;4</u>	<u>Panel 5&amp;6</u>	
<b>Radke 8/15/25</b>				
Dead Load	100,000	143,000	188,500	
Ratio to Panel 1	-	1.43	1.89	
Live Load	63,200	99,450	163,800	
Ratio to Panel 1	-	1.57	2.59	
LL/DL	.63	.70	.87	
DL ratio to Hemlock	2.18	2.50	2.47	
LL ratio to Hemlock	2.06	2.60	3.21	
DL ratio to Melrose	1.04	1.04	1.04	
LL ratio to Melrose	1.59	1.76	2.20	
	<u>Panel 1&amp;2</u>	<u>Panel 3&amp;4</u>	<u>Panel 5&amp;6</u>	<u>Panel 7</u>
<b>Bridgeport 4/19/30</b>				
Dead Load	144,500	237,500	316,000	355,000
Ratio to Panel 1	-	1.64	2.19	2.46
Live Load	62,000	101,700	135,400	152,200
Ratio to Panel 1	-	1.64	2.18	2.46
Impact Load	10,900	17,900	23,800	26,700
Ratio to Panel 1	-	1.64	2.18	2.45
LL/DL	.43	.43	.43	.43
DL ratio to Hemlock	3.16	4.14	4.15	
LL ratio to Hemlock	2.02	2.65	2.65	
DL ratio to Melrose	1.51	1.73	1.75	
LL ratio to Melrose	1.56	1.80	1.82	
DL ratio to Radke	1.45	1.66	1.68	
LL ratio to Radke	.98	1.02	.83	

Figure 4. Loading for Selected SHC Designed Bridges

a. Top Chord

		<u>Panel 1</u>	<u>Panel 2</u>	<u>Panel 3</u>	<u>Panel 4</u>	<u>Panel 5</u>
<b>HEMLOCK<sup>1</sup> 8/26/14</b>						
SPL: 200	Dead Load <sup>1</sup>	71,500	65,100	77,300	85,700	
RDW: 16	Ratio to Panel 1	-	.91	1.08	1.20	
Panels:12	Live Load	47,900	43,600	51,800	57,400	
Wood block floor	Ratio to Panel 1	-	.91	1.08	1.20	
	LL/DL	.67	.67	.67	.67	
<b>A-26 (Parker)<sup>2</sup> 8/23/13</b>						
SPL: 180	Dead Load	141,500	140,200	156,200	168,500	173,500
RDW: 18	Ratio to Panel 1	-	.99	1.10	1.19	1.23
Panels:10	Live Load	49,000	48,500	54,000	58,200	60,800
Concrete floor	Ratio to Panel 1	-	.99	1.10	1.19	1.24
	LL/DL	.35	.35	.35	.35	.35
	DL ratio to Hemlock	1.98	2.15	2.02	1.97	
	LL ratio to Hemlock	1.02	1.11	1.04	1.01	
<b>MELROSE 11/23/21</b>						
SPL: 200	Dead Load	158,700	145,600	194,900	214,200	
RDW: 20	Ratio to Panel 1	-	.92	1.23	1.35	
Panels:12	Live Load	65,600	60,200	80,500	88,500	
Concrete floor	Ratio to Panel 1	-	.92	1.23	1.35	
	LL/DL	.41	.41	.41	.41	
	DL ratio to Hemlock	2.22	2.24	2.52	2.50	
	LL ratio to Hemlock	1.37	1.38	1.55	1.54	
<b>RADKE 8/15/25</b>						
SPL: 200	Dead Load	165,800	152,000	211,000	224,000	
RDW: 19	Ratio to Panel 1	-	.92	1.27	1.35	
Panels:12	Live Load	104,300	95,900	156,000	237,900 <sup>3</sup>	
Concrete floor	Ratio to Panel 1	-	.92	1.50	2.28	
	LL/DL	.63	.63	.74	1.06	
	DL ratio to Hemlock	2.32	2.33	2.73	2.61	
	LL ratio to Hemlock	2.18	2.20	3.01	4.14	
	DL ratio to Melrose	1.04	1.04	1.08	1.05	
	LL ratio to Melrose	1.59	1.59	1.94	2.69	
<b>BRIDGEPORT 4/19/30</b>						
SPL: 231	Dead Load	248,000	228,500	306,000	341,500	355,000
RDW: 23	Ratio to Panel 1	-	.92	1.23	1.38	1.43
Panels:14	Live Load	106,200	98,000	131,200	146,400	152,200
Concrete floor	Ratio to Panel 1	-	.92	1.23	1.38	1.43
	Impact Load	18,700	17,200	23,000	25,700	26,700
	Ratio to Panel 1	-	.92	1.23	1.37	1.43
	LL/DL	.43	.43	.43	.43	.43
	DL ratio to Hemlock	3.50	3.51	3.96	3.99	
	LL ratio to Hemlock	2.22	2.25	2.53	2.55	
	DL ratio to Melrose	1.56	1.57	1.57	1.59	
	LL ratio to Melrose	1.62	1.63	1.63	1.65	
	DL ratio to Radke	1.50	1.50	1.45	1.52	
	LL ratio to Radke	1.02	1.02	.84	.62	

<sup>1</sup> Dead Load is as designed, not as built. See discussion in text.

<sup>2</sup> Although A-26 is a Parker it was the longest SHC design at that time.

<sup>3</sup> This is the figure on the plan, but it does seem excessive.

Figure 1. Pennsylvania Trusses in Wisconsin

<u>Year</u>	<u>SPL</u> <sup>1</sup>	<u>RDW</u> <sup>2</sup>	<u>VCL</u> <sup>3</sup>	<u>Road On</u> <sup>4</sup>	<u>River Crossed</u>	<u>Manufacturer/Builder</u>	<u>Township</u>	<u>County</u>	
Cobban	1908	2@241	15.7	12.4	CTH 'T'	Chippewa	Modern Steel Structures Co.	Arthur/ Eagle Point	Chippewa
Hemlock	1914	200	15.0	14.1	Warner Dr.	Black	Wausau Iron Works	Warner	Clark
Melrose	1921	200	19.0	14.1	STH 71&108	Black	Worden Allen	Melrose	Jackson
Radke	1925	200	19.0	14.3	STH 60	Kickapoo	Illinois Steel Bridge Co. & Minneapolis Bridge Co.	Wauzeka	Crawford
Bridgeport	1930	7@232 <sup>5</sup>	23.0	14.9 to 15.1	USH 18& STH 35	Wisconsin	Stevens Brothers St. Paul, Minnesota	Wyalusing	Crawford Grant
P 10-266 <sup>6</sup>	1938 <sup>7</sup>	200	15.0	16.0	River Rd.	Black	Unknown <sup>8</sup>	Levis	Clark

<sup>1</sup> Does not include approach spans.

<sup>2</sup> Roadway width.

<sup>3</sup> Vertical clearance.

<sup>4</sup> USH: U.S. Highway; STH: State Trunk Highway; CTH: County Trunk Highway.

<sup>5</sup> 232' is the average span length. The precise lengths vary from 231.3 to 232.9'.  
One span is across a slough and is 1/4 mile south of the other 6.

<sup>6</sup> No name has been found for this bridge yet. All bridges in Wisconsin have such an ID number.

<sup>7</sup> From Bridge Inspection Report files. No confirming source located yet. This could be the date it was moved to this site.

<sup>8</sup> May be Wausau Iron Works.